REMARKS

Summary of the Office Action

Claim 9 is objected to for a minor informality.

Claims 9 and 10 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kawakami (US Publication No. 2003/0190795) (hereinafter "Kawakami") in view of Sawada (U.S. Publication No. 2002/0115235 A1) (hereinafter "Sawada") and Kurosawa et al. (U.S. Patent No. 6,756,562 B1) (hereinafter "Kurosawa").

Claims 9 and 11 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Ohno (US Publication No. 2003/0077879) (hereinafter "Ohno") in view of Sawada and Fukuyo et al. (U.S. Publication No. 2004/0002199 A1) (hereinafter "Fukuyo").

Summary of the Response to the Office Action

Applicants have amended claim 9 and added new claim 12-14, and respectfully submit that the claims are allowable at least for the reasons set forth below. Claims 12-14 recite a method for manufacturing a semiconductor device. Upon entry of this Amendment, claims 9-14 will be pending for consideration.

The Objection to Claim 9

The above amendment to claim 9 changes the term "a front face" to "the front face" as requested by the Examiner. Accordingly, Applicants respectfully request that the Examiner withdraw this objection.

The 35 U.S.C. § 103(a) Rejections

Claims 9 and 10 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kawakami in view of Sawada and Kurosawa. Also, claims 9 and 11 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Ohno in view of Sawada and Fukuyo.

Applicants respectfully submit that one skilled in the art would not have found it obvious or possible to have combined the teachings of the references as set forth by the Examiner to have achieved the embodiment of the present invention even as recited in independent claim 9. Applicants respectfully submit that if one skilled in the art were to have combined the teachings of Kawakami or Ohno with those of Sawada, the embodiment of the present invention even as recited in claim 9 of the present application would not have been achieved. Rather, Applicants submit that such a combination may, at best, have achieved a semiconductor substrate cutting method for cutting a semiconductor substrate having a front face formed with a plurality of functional devices into the individual functional devices, so as to manufacture a semiconductor device having the functional device, with the method comprising the steps of: attaching a protective member to the front face of the semiconductor substrate, such that the functional devices are covered; attaching an expandable holding member to the rear face of the semiconductor substrate by way of a die bonding resin layer after attaching the protective member; cutting the semiconductor substrate and the die bonding resin layer along each of the lines in the grid by a dicing blade after attaching the holding member, so as to obtain a plurality of semiconductor chips each having the front face formed with the functional device and having a cut piece of the die bonding resin layer in close contact with the rear face thereof; and

mounting the semiconductor chip onto a support body by way of the cut piece of the die bonding resin layer in close contact with the rear face thereof, so as to obtain the semiconductor device.

Furthermore, Applicants submit that even if the above-mentioned semiconductor substrate cutting method were to have been further modified in accordance with the teachings of Kurosawa or Fukuyo, the embodiment of the present invention even as recited in independent claim 9 would not have been achieved. Namely, Applicants submit that at best, the combination would have achieved a semiconductor substrate cutting method for cutting a semiconductor substrate having a front face formed with a plurality of functional devices into the individual functional devices, so as to manufacture a semiconductor device having the functional device, with the method comprising the steps of: attaching a protective member to the front face of the semiconductor substrate, such that the functional devices are covered; attaching an expandable holding member to the rear face of the semiconductor substrate by way of a die bonding resin layer after attaching the protective member; irradiating the semiconductor substrate with laser light while positioning a light-converging point within the semiconductor substrate after attaching the holding member, so as to form first modified region, and causing the first modified region to form first starting point region for cutting along each line along which the semiconductor substrate should be cut, the lines set like a grid running between the neighboring functional devices; irradiating the die bonding resin layer with laser light while positioning a light-converging point within the die bonding resin layer after attaching the holding member, so as to form second modified region, and causing the second modified region to form second starting point region for cutting along each of the lines in the grid; cutting the semiconductor substrate from the first starting point regions for cutting along each of the lines in the grid and

cutting the die bonding resin laver from the second starting point regions for cutting along each of the lines in the grid by expanding the holding member after forming the starting point regions for cutting, so as to obtain a plurality of semiconductor chips each having the front face formed with the functional device and having a cut piece of the bonding resin layer in close contact with the rear face thereof; and mounting the semiconductor chip onto a support body by way of the cut piece of the die bonding resin layer in close contact with the rear face thereof, so as to obtain the semiconductor device.

Applicants further respectfully submit that when the die bonding resin layer is cut from the second starting point regions for cutting along each of the lines in the grid as above, the die bonding resin layer is not smoothly cut, and cut surfaces of the die bonding resin layer become uneven. Because it is necessary to irradiate the semiconductor substrate with laser light while positioning a light-converging point within the semiconductor substrate and irradiate the die bonding resin layer with laser light while positioning a light-converging point within the die bonding resin layer, such a technique is extremely complex.

On the contrary, according to the claimed embodiments of the present invention, "an expandable holding member is attached to the rear face of the semiconductor substrate by way of a die bonding resin layer after forming the starting point regions for cutting," and "the semiconductor substrate is cut into a plurality of semiconductor chips from the starting point regions for cutting along each of the lines in the grid and the die bonding resin layer is cut along each of cut surfaces of the semiconductor chips by expanding the holding member after attaching the holding member, so as to obtain the semiconductor chips each having the front face formed with the functional device and having a cut piece of the die bonding resin layer in close contact

with the rear face thereof." Here, as the holding member expands, opposing cut surfaces of the semiconductor chips are released from their close contact state. Therefore, simultaneously with the cutting of the semiconductor substrate, the die bonding resin layer closely in contact with the rear face of the semiconductor substrate is cut along each of the lines in the grid. (See, for example, the description in paragraph 0046 of the present application).

Again, Applicants respectfully submit that in accordance with the claimed embodiments of the present invention, "the semiconductor substrate is cut into a plurality of semiconductor chips from the starting point regions for cutting along each of the lines in the grid and the die bonding resin layer is cut along each of cut surfaces of the semiconductor chips by expanding the holding member." However, although both Kurosawa and Fukuyo may disclose that the semiconductor substrate is cut into a plurality of semiconductor chips from the starting point regions for cutting along each of the lines in the grid by expanding the holding member, neither Kurosawa nor Fukuyo discloses that "the die bonding resin layer is cut along each of cut surfaces of the semiconductor chips by expanding the holding member."

As can be appreciated from the foregoing, in accordance with the claimed embodiments of the present invention, a semiconductor substrate having a front face formed with a functional device can efficiently and accurately be cut together with a die bonding resin layer. On the contrary, when the semiconductor substrate and the die bonding resin layer are cut by a dicing blade as described in Sawada, that is, after attaching an expandable holding member to the rear face of the semiconductor substrate by way of a die bonding resin layer, the cut surfaces of the die bonding resin layer become rough and clogging occurs to the dicing blade. Therefore, Applicants submit that even if the methods of Kawakami and Kurosawa were to have been modified according to Sawada, such a modification would not have achieved a method in which

"an expandable holding member is attached to the rear face of the semiconductor substrate by way of a die bonding resin layer after forming the starting point regions for cutting."

Applicants respectfully submit that for at least the above reasons, all claims should be allowable.

CONCLUSION

In view of the foregoing remarks, Applicants respectfully submit that all of the pending claims are now in prima-facie condition for allowance, and respectively request the timely allowance of the pending claims. Withdrawal of all outstanding rejections and objections is respectfully requested. Should the Examiner feel that there are any issues outstanding after consideration of this response, the Examiner is invited to contact Applicants' undersigned representative to expedite prosecution. A favorable action is awaited.

Respectfully submitted,

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